MDDC - 1061

UNITED STATES ATOMIC ENERGY COMMISSION

TECHNICAL PROGRESS REPORT ON THE METABOLIC STUDIES OF FISSION PRODUCTS

by

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Date of Manuscript: May 2, 1944.
Date Declassified: June 25, 1947.

Technical Information Division, Oak Ridge Operations

AEC, Oak Ridge, Tenn., 10-29-48-850-12984

Printed in U.S.A.
PRICE 5 CENTS

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SUMMARY

Incomplete tracer studies with product indicate that less than 0.05% of this element is absorbed from the digestive tract in any of the three valence states. The behaviour of plus 4 product following intramuscular and intrapulmonary administration is very similar to that of zirconium. The metabolic properties of plus 3 and plus 6 product are very similar to those of yttrium and plus 3 pre product.

I. PRODUCT

Short time experiments of one and four days after administration reveal a striking similarity to the distribution of radioactive material in the lungs to the results obtained with zirconium and columbium in that the product is scattered widely throughout the alveolar structure in myriads of tiny points whose diameter is apparently less than 50 microns. No significant deposition in the blood vessels, bronchial tree, and lymph tissues of the lungs was observed. A larger series of experiments using all three valence states is now under way.

A. Method

A series of tracer experiments with rats have been undertaken with product in all three of the valence states in the form of a solution. Three animals were used for each group and the dose of product per animal was 15 micrograms. Two groups of three animals each received plus 4 product by intramuscular injection, one group was sacrificed at four days, the other at sixteen days. A third group of three animals was given plus 3 product and a fourth group plus 6 product by intramuscular injection and these last two groups sacrificed at sixteen days. Six groups of three animals each were given product by intrapulmonary administration in all three valence states and the groups sacrificed at four and sixteen days. Three groups of three animals each received product by stomach tube in the three valence states. All of the groups listed above have been sacrificed and quantitative product assays made to date of roughly 30% of all the tissues.

B. Results of Px $(NO_3)_4$

The information in hand at present indicates that the oral absorption of product by way of the gastro-intestinal tract in all of its three valence states is less than 0.05%. Following intramuscular injection the plus 4 product at both four and sixteen days was very poorly absorbed from the site of injection, at four days only 4.2% was absorbed from the muscle and at 16 days 12.4%. Of the absorbed fraction roughly 30% at both time intervals was deposited in the skeleton and much smaller amounts were present in the liver and kidneys which were the next most active tissues on a per gram basis of wet weight. 1% of the absorbed dose of plus 4 product was eliminated during the first four days. At sixteen days following intrapulmonary administration 95% was retained by the lungs and approximately 80% of that absorbed was found to be deposited in the skeleton. Information on hand at present indicates a striking resemblence in absorption, distribution, and excretion of plus 4 product to carrier free

zirconium following oral, intramuscular and intrapulmonary administration.

C. Results $PxCl_3$, $PxO_2(NO_3)_2$

At sixteen days following intramuscular injection the skeleton retained approximately 55% of the absorbed dose of product in the plus 3 and plus 6 states. 32.1% plus 3 product was absorbed from the site of injection while 67.48% of the plus 6 product was absorbed from the muscle. 27.8% of the absorbed dose of plus 6 product was excreted at sixteen days with the digestive tract acting as the chief channel of elimination. Following intrapulmonary administration at four days approximately 50% of the plus 3 product was retained by the lungs and over 80% of the absorbed dose was present in the skeleton. In the case of plus 6 product 32% was retained by the lungs and almost 90% of the absorbed dose was in the skeleton. The behaviour of plus 3 and plus 6 product following intramuscular and intrapulmonary injection resembled most closely the metabolic properties of yttrium and plus 3 pre product.

It must be kept in mind that the data present here is as yet incomplete and must be considered as a qualitative index of the metabolic behavior of product pending completion of the remaining tissue assays.

Considerable care has been taken to insure the accuracy of method employed for tissue assay. The fluoride method is employed for the separation of product from the tissue ash and each sample of tissue received two independent assays which had to check better than 5% before they were considered acceptably accurate. The recovery of the administered dose from the tissue and excreta for the few total animal assays that have been completed was better than 95%.

II. PROJECTED STUDIES FOR THE NEXT TWO MONTHS

Tracer studies are to be continued.

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